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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

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**TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371**

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)

**09/807503**

INTERNATIONAL APPLICATION NO.  
PCT/EP99/07703

INTERNATIONAL FILING DATE  
October 14, 1999

PRIORITY DATE CLAIMED  
October 14, 1998

**TITLE OF INVENTION**  
DEVICE FOR MIXING TWO PASTY SUBSTANCES... DENTAL IMPRESSION... CATALYST SUBSTANCE

**APPLICANT(S) FOR DO/EO/US**  
Bubblowitz, Alexander and Suchan, Matthias

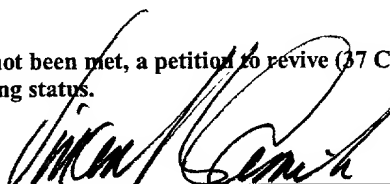
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☒ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☐ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11 to 16 below concern document(s) or information included:**

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.  
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:



17. <input checked="" type="checkbox"/> The following fees are submitted:				CALCULATIONS		PTO USE ONLY
<b>BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):</b>						
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... \$1000.00						
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... \$860.00						
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$710.00						
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$690.00						
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$100.00						
<b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				\$ 1000.00		
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$		
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE			
Total claims	24 - 20 =	4	X \$18.00	\$ 72.00		
Independent claims	1 - 3 =	0	X \$80.00	\$ 0		
MULTIPLE DEPENDENT CLAIM(S) (if applicable) "as amended"			+ \$270.00	\$ 0		
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$ 1072.00		
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$ 536.00		
<b>SUBTOTAL =</b>				\$ 536.00		
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$		
<b>TOTAL NATIONAL FEE =</b>				\$ 536.00		
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+	\$ 40.00	
<b>TOTAL FEES ENCLOSED =</b>				\$ 576.00		
				Amount to be refunded:	\$	
				charged:	\$	
<p>a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>576.00</u> to cover the above fees is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>18-0145</u>. A duplicate copy of this sheet is enclosed.</p>						
<p><b>NOTE:</b> Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p>						
<p>SEND ALL CORRESPONDENCE TO:  DILLER, RAMIK &amp; WIGHT, P.C.  7345 McWhorter Place; Suite 101  Annandale, Virginia 22003</p>				<p style="text-align: center;"></p> <p>SIGNATURE:  Vincent L. Ramik</p> <p>NAME  Reg. No. 20,663</p> <p>REGISTRATION NUMBER</p>		
<p>Filed: <u>April 16, 2001</u>, 20<u>    </u></p>						

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Alexander BUBLEWITZ et al.

PCT/EP99/07703 FILED 10/14/99

Filed Nationally USA: 04/16/01

DEVICE FOR MIXING TWO PASTY SUBSTANCES,  
IN PARTICULAR FOR MIXING A DENTAL IMPRESSION  
SUBSTANCE WITH A CATALYST SUBSTANCE

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April 16, 2001

Box PCT  
Assistant Commissioner of Patents  
Washington, D.C. 20231

**PRELIMINARY AMENDMENT**

Sir:

Contemporaneously with the filing of the of the above-captioned PCT designated office patent application and prior to examination on the merits thereof, please amend the application as follows:

**IN THE SPECIFICATION:**

Page 1, before line 1, insert the following heading:

-- TITLE OF THE INVENTION --;

and

Page 1, between lines 2 and 3, insert the following heading:

-- BACKGROUND OF THE INVENTION --;

Page 2, between lines 3 and 4, insert the following heading:

- - SUMMARY OF THE INVENTION - -.

Page 5, between lines 2 and 3, insert the following heading:

- - BRIEF DESCRIPTION OF THE DRAWINGS - -.

and

Page 5, between lines 10 and 11, insert the following heading:

- - DESCRIPTION OF THE PREFERRED EMBODIMENTS - -.

Page 8, after the last line, please insert the following new paragraph:

- - Although a preferred embodiment of the invention has been specifically illustrated and described herein, it is to be understood that minor variations may be made in the apparatus without departing from the spirit and scope of the invention, as defined the appended claims. - -

**IN THE CLAIMS:**

After the heading "CLAIMS" insert the following new paragraph:

-- What is claimed is: --

Please cancel all of the claims of record (claims 1 through 9) and add the following newly drafted claims:

10. Device for mixing two pasty substances, in particular a dental impression substance with a catalyst substance, the device comprising

- a housing (42) comprising an essentially tubular section (44) having two inlet openings (68,70) for the two pasty substances at the rear end and an outlet opening (52) for the mixed pasty substances at the front end of the tubular section (44),
- a driveable mixer shaft (38) extending through the tubular section (44) and rotatably supported in the housing (42),
- wherein the mixer shaft (38) comprises a plurality of rigid mixer elements (74) protruding from an axis (72) and serving for mixing the two pasty substances during their passage through the tubular section (44) of the housing (42), and
- an insertion part (62) arranged at the rear end (48) of the housing (42) and extending transversally to the axis (72), the insertion part (62) comprising an inner surface facing the tubular section (44) of the housing (42) and an outer surface forming the rear end (48) of the housing (42) and comprising two inlet stubs,

characterized in that

- the inlet openings (68,70) radially end in the essentially tubular section (44) of the housing (42),
- the mixer shaft (38) comprises at the level of the radial inlet openings (68,70) at least one deflection element (80) for deflecting the pasty substances radially fed through the inlet openings (68,70) to the tubular section (44) of the housing (42), wherein the at least one deflection element (80) comprises a deflection surface (82) extending about the axis (72) and at an inclination to a radial plane of the axis (72),
- the insertion part (62) is provided on its inner surface with a cylindrical deepened reception portion (69) for the section of the mixer shaft (38) carrying the at least one deflection element (80), and
- from the inlet stubs (54,56) on the outer side of the insertion part (62) two ducts (64,66) extend which end in radial openings of the cylindrical deepened

reception portion (69) on the inner side of the insertion part (62), said openings forming the inlet openings (68,70).

11. Device according to claim 10, characterized in that the at least one deflection element (80) is designed as a wedge.
12. Device according to claim 10, characterized in that two deflection elements (80) are provided which are arranged diametrically opposite each other about the axis (72).
13. Device according to claim 11, characterized in that two deflection elements (80) are provided which are arranged diametrically opposite each other about the axis (72).
14. Device according to claim 10, characterized in that the two deflection elements (80) extend over an angular range of  $90^{\circ}$  to  $180^{\circ}$ .
15. Device according to claim 11, characterized in that the two deflection elements (80) extend over an angular range of  $90^{\circ}$  to  $180^{\circ}$ .
16. Device according to claim 12, characterized in that the two deflection elements (80) extend over an angular range of  $90^{\circ}$  to  $180^{\circ}$ .
17. Device according to claim 10, characterized in that the at least one deflection element (80) comprises a deflection surface (82) helically extending about the axis (72).
18. Device according to claim 11, characterized in that the at least one deflection element (80) comprises a deflection surface (82) helically extending about the axis (72).

19. Device according to claim 12, characterized in that the at least one deflection element (80) comprises a deflection surface (82) helically extending about the axis (72).
20. Device according to claim 14, characterized in that the at least one deflection element (80) comprises a deflection surface (82) helically extending about the axis (72).
21. Device according to claim 10, characterized in that an identical number of mixer elements (74) within a plurality of radial planes protrude from the axis (72) and extend up to near the inner surface (76) of the tubular section (44) of the housing (42).
22. Device according to claim 11, characterized in that an identical number of mixer elements (74) within a plurality of radial planes protrude from the axis (72) and extend up to near the inner surface (76) of the tubular section (44) of the housing (42).
23. Device according to claim 12, characterized in that an identical number of mixer elements (74) within a plurality of radial planes protrude from the axis (72) and extend up to near the inner surface (76) of the tubular section (44) of the housing (42).
24. Device according to claim 14, characterized in that an identical number of mixer elements (74) within a plurality of radial planes protrude from the axis (72) and extend up to near the inner surface (76) of the tubular section (44) of the housing (42).

25. Device according to claim 17, characterized in that an identical number of mixer elements (74) within a plurality of radial planes protrude from the axis (72) and extend up to near the inner surface (76) of the tubular section (44) of the housing (42).
26. Device according to claim 21, characterized in that within a number of radial planes equal to the number of mixer elements (74) per radial plane two mixer elements (74) respectively adjacent to each other in circumferential direction are connected with each other via a portion (78,78') extending in circumferential direction, and that these pairs of mixer elements (74) connected with each other are staggered from radial plane to radial plane in circumferential direction.
27. Device according to claim 10, characterized in that the mixer shaft (38) comprises a plurality of radially protruding stripper elements (84) which are of flexible configuration and comprise free ends averted from the axis (72) and moving along the inner surface (76) of the tubular section (44) of the housing (42).
28. Device according to claim 11, characterized in that the mixer shaft (38) comprises a plurality of radially protruding stripper elements (84) which are of flexible configuration and comprise free ends averted from the axis (72) and moving along the inner surface (76) of the tubular section (44) of the housing (42).
29. Device according to claim 12, characterized in that the mixer shaft (38) comprises a plurality of radially protruding stripper elements (84) which are of flexible configuration and comprise free ends averted from the axis (72) and moving along the inner surface (76) of the tubular section (44) of the housing (42).



30. Device according to claim 14, characterized in that the mixer shaft (38) comprises a plurality of radially protruding stripper elements (84) which are of flexible configuration and comprise free ends averted from the axis (72) and moving along the inner surface (76) of the tubular section (44) of the housing (42).
31. Device according to claim 17, characterized in that the mixer shaft (38) comprises a plurality of radially protruding stripper elements (84) which are of flexible configuration and comprise free ends averted from the axis (72) and moving along the inner surface (76) of the tubular section (44) of the housing (42).
32. Device according to claim 21, characterized in that the mixer shaft (38) comprises a plurality of radially protruding stripper elements (84) which are of flexible configuration and comprise free ends averted from the axis (72) and moving along the inner surface (76) of the tubular section (44) of the housing (42).
33. Device according to claim 26, characterized in that the mixer shaft (38) comprises a plurality of radially protruding stripper elements (84) which are of flexible configuration and comprise free ends averted from the axis (72) and moving along the inner surface (76) of the tubular section (44) of the housing (42).

IN THE ABSTRACT:

Please cancel the present Abstract in its entirety and substitute therefore the following (marked-up copy attached):

### ABSTRACT OF THE DISCLOSURE

A device for mixing two pasty substances is provided with a housing including an essentially tubular section having two radial inlet openings at a rear end and an outlet opening at a front end of the tubular section, and a driveable mixer shaft extending through the tubular section and rotatably supported in the housing. The mixer shaft includes multiple rigid mixer elements protruding from an axis for mixing the two pasty substances when they pass through the tubular section. The mixer shaft includes at the level of the inlet openings at least one deflection element for promoting the axial transportation of the two pasty substances when fed through the inlet openings, wherein the at least one deflection element has a deflection surface extending about the axis and at an inclination to a radial plane of the axis.

... REMARKS continued on page 9...

Remarks

Commensurate with the filing of this application, the Examiner is respectfully requested to introduce this amendment in order that the proper headings are inserted, all multiple dependent claims cancelled and both the government filing fee and examination are based upon the claims now of record after the introduction of the present amendment.

Upon entry of this amendment, favorable consideration on the merits of the claims is respectfully solicited.

Respectfully submitted,

DILLER, RAMIK & WIGHT

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Attachment: Marked-up Abstract

Bublewitz et al  
PCT/ep99/07704 filed 10/14/00  
Filed USA: 04/13/01

**MARKED UP ABSTRACT OF THE DISCLOSURE**

**[ABSTRACT**

**Device for mixing two pasty substances, in particular for mixing a dental  
impression substance with a catalyst substance]**

**ABSTRACT OF THE DISCLOSURE**

[The] A device for mixing two pasty substances[, in particular a dental impression substance with a catalyst substance,] is provided with a housing [(42) comprising] including an essentially tubular section [(44)] having two radial inlet openings [(68, 70) for the two pasty substances] at [its] a rear end and an outlet opening [(52) for the mixed pasty substances] at [the] a front end of the tubular section [(44)], and [with] a driveable mixer shaft [(38)] extending through the tubular section [(44)] and rotatably supported in the housing [(42)]. [Said] The mixer shaft [(38) comprises a plurality of] includes multiple rigid mixer elements [(74)] protruding from an axis [(72) and serving] for mixing the two pasty substances when they pass through the tubular section [(44) of the housing (42)]. The mixer shaft [(38) comprises] includes at the level of the inlet openings [(68,70)] at least one deflection element [(80)] for promoting the [transport in axial direction] axial transportation of the two pasty substances when fed through the inlet openings [(68,70) to the tubular section (44) of the housing (42)], wherein the at least one deflection element [(80)] has a deflection surface [(82)] extending about the axis [(72)] and at an inclination to a radial plane of the axis [(72)].

[Fig. 2]

**Device for mixing two pasty substances, in particular for mixing a dental impression substance with a catalyst substance**

5 The invention relates to a device for mixing two pasty substances which are in particular a dental impression substance and a catalyst substance for accelerating polymerization of the dental impression substance.

10 The device according to the invention is attached onto the two outlet stubs of a discharge device, via which the pasty substances are fed to the mixing device by application of pressure, and after mixing in the mixing device the pasty substances are discharged in the form of a mixture.

15 In several technical applications it is necessary to apply two separately stored pasty substances in form of a mixture. For this purpose either dynamical or statical continuous mixers are used which mix the substances with each other when the pasty substances flow through a mixer housing. A dynamical mixer is known from EP-A-0 492 412. This known device comprises an essentially tubular mixer housing with a mixer shaft rotatably arranged therein. The mixer shaft comprises a plurality of radially protruding web-shaped mixer elements which, when the mixer shaft is driven, serve for deflection of the substance flows thus mixing the two pasty substances with each other. The pasty substances are fed via a radial front wall at the rear end of the mixer housing into the latter. For this purpose the front wall comprises two inlet stubs which are attached onto the outlet stubs of a device for discharging the pasty substances.

20 To prevent contamination in the direction of the outlet stubs of the discharge device the known mixer comprises stripping elements protruding from the mixer shaft, the stripping elements moving along the inner side of the rear-side front wall and transporting pasty material entering via the inlet stubs to the side. The pasty material supplied via one of the inlet stubs inside the housing is at least partially transported in circumferential direction by said strippers thus being fed to the area of the other inlet stub where contamination

tion in the direction of the inlet stub and further in the direction of the outlet stub of the respective discharge device connected with the inlet stub may occur when the dynamic mixer is not driven.

- 5 It is an object of the invention to provide a device for mixing two pasty substances where the risk of contamination in backward direction is reduced.

To solve this object the invention suggests a device for mixing two pasty substances, the device comprising

- 10 - a housing comprising an essentially tubular section having two radial inlet openings for the two pasty substances at the rear end and an outlet opening for the mixed pasty substances at the front end of the tubular section,
- a driveable mixer shaft extending through the tubular section and rotatably supported in the housing,
- 15 - wherein the mixer shaft comprises a plurality of rigid mixer elements protruding from an axis, the mixer elements serving for mixing the two pasty substances during their passage through the tubular section of the housing.

20

According to the invention said device is characterized in that the mixer shaft comprises at the level of the inlet openings at least one deflection element for promoting the transport in axial direction of the pasty substances fed through the inlet openings to the tubular section of the housing, wherein the at least

25 one deflection element comprises a deflection surface extending about the axis and at an inclination to a radial plane of the axis.

In the mixing device according to the invention (hereinafter referred to as dynamic mixer) the pasty substances to be mixed are radially supplied to the

30 essentially tubular section of the mixer housing. For this purpose the tubular section of the housing is provided with two radial inlet openings in particular arranged diametrically opposite each other. The pasty substance flows fed to

the mixer by application of pressure are supplied within the tubular section of the housing to at least one deflection element which extends about the axis of the mixer shaft. Said deflection element rotates together with the rotating mixer shaft and comprises a deflection surface extending at an inclination to a radial plane of the axis. In other words, the at least one deflection element is an essentially saw-tooth wedge extending in an arcuate manner about the axis of the mixer shaft. Said deflection element acts in the same way as a screw conveyor in a screw-type pump and ensures that the incoming pasty material is directly transported in axial direction from the inlet openings towards the outlet opening. This reliably prevents contamination in backward direction since the at least one deflection element always promotes the axial transport of the pasty substances fed through the inlet openings to the tubular section of the mixer housing.

As already said above, the deflection element can be of wedge-type configuration. Alternatively to this wedge form the deflection element can be designed as a web extending helically about the axis; in this embodiment the deflection element is configured as a thread. Such helical webs are known from screw-type pumps and screw conveyors.

Advantageously, at the level of the radial inlet openings of the tubular section of the housing two deflection elements are provided on the axis, the deflection elements appropriately being arranged diametrically opposite each other. Said deflection elements or each deflection element preferably extends over an angular range of  $180^\circ$  to  $90^\circ$ .

To be able to attach the dynamic mixer according to the invention onto the two outlet stubs of a squeezing device, the housing comprises at its rear end an insertion part oriented at an inclination to the axis, on which insertion part two inlet stubs are protrudingly arranged. Said insertion part is located in a flared housing section of the mixer joining the tubular section, and comprises two ducts extending from the inlet stub. Said two ducts radially extend, at an

angle, to a central cylindrical deepened reception portion on the inner side of the insertion part, which deepened portion receives the axis of the mixer shaft with the at least one deflection element. Thus the cylindrical deepened reception portion of the insertion part forms a portion of the tubular housing section of the mixer.

According to a preferred aspect of the invention a plurality of mixer elements are located between the radial inlet openings and the axial outlet opening within the tubular housing section, said mixer elements protruding in the form of radial webs from the axis and extending up to near the inner surfaces of the tubular housing section. Within several radial planes said mixer elements are arranged such that they protrude from the shaft, which results in deflection of substance flows axially extending through the housing. This leads to the desired mixing effect. The mixing effect is intensified when said mixer elements, which prevent direct flow between the inlet openings and the outlet opening due to their radial orientation, extend over a larger angular range, e. g.  $90^\circ$ . This can be realized by connecting adjacent mixer elements via a circumferential portion. In this way, mixer elements in the form of quarter circles are configured, wherein it may be of advantage if the middle sections of these quarter circles, as seen in circumferential direction, protrude from the inner surface of the tubular section of the housing to a larger extent than their ends. It is appropriate if two adjacent radially extending mixer elements staggered from radial plane to radial plane, as seen in circumferential direction, are connected with each other in the manner described above.

Besides arrangement of the rigid mixer elements as described above it is of advantage with regard to the mixing process if the mixer shaft comprises additional flexible stripper elements which move along the inner wall of the tubular housing due to their flexible configuration or at least due their flexible free ends arranged at a distance to the axis.



Hereunder an embodiment of the invention is explained in detail with reference to the drawings in which:

Fig. 1 shows a general side view of a discharge device for mixed pasty components,

Fig. 2 shows a longitudinal section of the dynamic mixer used for the discharge device shown in Fig. 1,

Figs. 3 to 6 show cross-sections of the mixer shown in Fig. 2 along the lines III-III, IV-IV, V-V and VI-VI, and

Fig. 7 shows a cross-section similar to that of Fig. 6 but of an alternative embodiment of the mixer shaft.

15

Fig. 1 shows a side view of a discharge device 10 for two pasty components to be mixed with each other. Said device 10 comprises a squeezing part 12 and a mixing part 14, said squeezing part 12 having two pressure containers 16, 18 for receiving two bags 20,22 containing the pasty substances. At the front ends 24,26 of the pressure containers 16,18 the latter comprise outlet stubs 28,30 via which the contents of the bags 20,22 is discharged when pressure is applied to the rear end of the bags 20,22. Pressure is applied to the bags 20,22 by means of motor-driven pressure stamps 32,34, which is not shown in detail here.

25

Onto the outlet stubs 28,30 a dynamic mixer 36 is attached which is hereunder described in detail with reference to Figs. 2 to 7. Concerning said dynamic mixer 36 it can generally be said that its mixer shaft 38 is driven by a motor. For this purpose the mixer shaft 38 is adapted to be coupled with a drive rod 40 which is rotatingly driven by a motor which is not shown either.

30

The details of the dynamic mixer 36 are shown in Fig. 2. This figure shows a longitudinal section of the mixer 36. The mixer 36 comprises a housing 42 which has an essentially cylindrical or tubular section 44 with a flared end section 46 at the rear end 48 facing the squeezing part 12, and a tapered front end 50. Said tapered end 50 is designed as outlet stub and defines the outlet opening 52 for the material mixture, while at the rear end 48 of the housing 42 two inlet stubs 54,56 are arranged which are adapted to be attached onto the outlet stubs 28,30 of the squeezing part 12. Between the two inlet stubs 54,56 a passage 58 is provided in which one end 60 of the mixer shaft 38 is rotatably supported. Via said passage the drive rod 40 can be coupled with the mixer shaft 38.

The inlet stubs 54,56 and the passage 58 are configured in an insertion part 62 which is inserted into the flared section 46 at the rear end 48 of the housing 42. Proceeding from the inlet stubs 54,56 two ducts 64,66 extend through the insertion part 62, the ducts being deflected and ending in radial openings 68,70. Said inlet openings 68,70 are radially arranged relatively to the cylindrical section 44 of the mixer housing 42. Via the ducts 64,66 the two pasty components are transported into the dynamic mixer 36 where they are fed in radial direction to the mixer shaft 38.

As can be seen in Figs. 2 and 3 the insertion part 62 comprises a central essentially cylindrical deepened reception portion 69 which is arranged concentrically to the passage 58 and into which the mixer shaft 38 is inserted. In the cylindrical wall 71 of the deepened reception portion 69 the inlet openings 68,70 are provided. Further, the ducts 64,66 are configured in this area. Said ducts 64,66 are configured as grooves or recesses which are open at the top and which, together with the essentially flared housing section 46, form the ducts closed on all sides.

The mixer shaft 38 comprises a rotatably supported axis 72 from which, in a plurality of radial planes, four web-type mixer elements 74 each protrude es-

sentially in radial direction. The exact arrangement of said mixer elements 74  
 is shown in the sectional representation of Fig. 4. It can be seen that the  
 mixer element 74 limiting side edges lying in the circumferential direction ex-  
 tend essentially tangentially to the circumferential surface of the axis 72. Ac-  
 5 cording to Fig. 4 four mixer elements 74 are provided for each radial plane,  
 the mixer elements 74 reaching up to near the inner surface 76 of the cylin-  
 drical housing section 44 as is shown in Fig. 2. The overall area between the  
 inlet openings 68,70 and the end of the mixer shaft 38, which extends up to  
 the tapered end 50 of the mixer housing 42, is provided with said mixer ele-  
 10 ments 74. Further, the mixer shaft 38 comprises mixer elements 78 config-  
 ured as quarter circuit areas which are formed by connecting two adjacent  
 mixer elements 74 of a radial plane (see, for example, the sectional represen-  
 tation of Fig. 5). In this embodiment the radially outer limiting edge of the  
 mixer element 78 is of circular arc configuration, while it extends secantially  
 15 in the alternative shown in Fig. 7. The mixer element 78' shown in Fig. 7 thus  
 comprises, in a middle circumferential section, a larger section towards the  
 inner surface 76 of the cylindrical housing section 44.

While the mixer elements 74,78,78', owing to their radial extension up to near  
 20 the cylindrical housing section 44, ensure deflection and thus swirling of the  
 axially flowing pasty substances when the mixer shaft 38 rotates, the mixer  
 shaft 38 comprises in the area of the radial inlet openings 68,70 two deflec-  
 tion elements 80 configured in the form of a screw conveyor. The deflection  
 elements 80 are designed as saw-tooth wedges extending over approximately  
 25 90° about the axis 72 of the mixer shaft 38. Said deflection elements 80 have  
 a deflection surface 82 ascending in circumferential direction, said deflection  
 surface 82 being directed towards the outlet end 52 of the dynamic mixer 36  
 and extending at an angle to a plane extending radially to the axis 72. Said  
 deflection elements 80 thus extend helically in sections and provide an axial  
 30 movement component of the pasty substance flows. Thus the deflection ele-  
 ments 80 promote the removal of a pasty substance entering the cylindrical  
 housing section 44 via the inlet openings 68,70. This promoted and thus in-

tensified removal of the pasty substances in axial direction reduces the danger of contamination of the two pasty substances, i. e. the undesired mixing of the two pasty substances or their contamination in the direction of the inlet openings 68,70 into the ducts 64,66 and possibly up to the outlet stubs 28,30. If contamination and thus polymerization occurs in these areas, it is no longer possible to discharge any residual material of the bags 20,22 owing to clogged outlet stubs 28,30.

Another feature of the dynamic mixer 36 is to be explained with reference to Fig. 6. The mixer elements 74 described above are of rigid configuration and essentially radially protruding webs which cause swirling of the substance flows due to rotation of the axis 72. In addition to the rigid mixer elements 74 the dynamic mixer 36 comprises further mixer elements 84 designed as thin and flexible webs, said mixer elements 84 moving from the inside along the inner side 76 of the cylindrical housing section 44. These additional flexible mixer elements 84, too, cause swirling of the substance flows. One flexible mixer element 84 per plane is provided in a plurality of contiguous radial planes of the mixer shaft 38, said mixer elements 84 being staggered from radial plane to radial plane by a constant angular range. The same applies to the mixer elements 78 and 78', respectively, which connect two adjacent mixer elements 74 and are also staggered from radial plane to radial plane, in this case by 90°. Said mixer elements 84 and the mixer elements 78 and 78', respectively, are thus uniformly distributed along a helical line about the axis 72. Both types of mixer elements are very well suited for homogeneous mixing of pasty substances in a dynamic mixer 36 which can also be referred to as continuous mixer.

**CLAIMS**

1. Device for mixing two pasty substances, in particular a dental impression substance with a catalyst substance, the device comprising
  - a housing (42) comprising an essentially tubular section (44) having two radial inlet openings (68,70) for the two pasty substances at the rear end and an outlet opening (52) for the mixed pasty substances at the front end of the tubular section (44),
  - a driveable mixer shaft (38) extending through the tubular section (44) and rotatably supported in the housing (42),
  - wherein the mixer shaft (38) comprises a plurality of rigid mixer elements (74) protruding from an axis (72) and serving for mixing the two pasty substances during their passage through the tubular section (44) of the housing (42),

characterized in that

- the mixer shaft (38) comprises at the level of the inlet openings (68,70) at least one deflection element (80) for promoting the transport in axial direction of the pasty substances fed through the inlet openings (68,70) to the tubular section (44) of the housing (42), wherein the at least one deflection element (80) comprises a deflection surface (82) extending about the axis (72) and at an inclination to a radial plane of the axis (72).
2. Device according to claim 1, characterized in that the at least one deflection element (80) is designed as a wedge.
  3. Device according to claim 1 or 2, characterized in that two deflection elements (80) are provided which are arranged diametrically opposite each other about the axis (72).

4. Device according to one of claims 1 to 3, characterized in that the two deflection elements (80) extend over an angular range of  $90^{\circ}$  to  $180^{\circ}$ .
5. Device according to one of claims 1 to 4, characterized in that the at least one deflection element (80) comprises a deflection surface (82) helically extending about the axis (72).
6. Device according to one of claims 1 to 5, characterized in that the housing (42) comprises at its rear end (48) an insertion part (62) oriented transversally to the axis (72), the insertion part (62) comprising an outer surface forming the rear end (48) of the housing (42) and an inner surface facing the tubular section (44) of the housing (42), the inner surface being provided with a cylindrical deepened reception portion (69) for the section of the mixer shaft (38) carrying the at least one deflection element (80), and that the outer surface of the insertion part (62) comprises two inlet stubs (54,56) from which two ducts (64,66) extend through the insertion part (62), in which ducts (64,66) end radial openings of the cylindrical deepened reception portion (69) forming the inlet openings (68,70).
7. Device according to one of claims 1 to 6, characterized in that an identical number of mixer elements (74) within a plurality of radial planes protrude from the axis (72) and extend up to near the inner surface (76) of the tubular section (44) of the housing (42).
8. Device according to claim 7, characterized in that within a number of radial planes equal to the number of mixer elements (74) per radial plane two mixer elements (74) respectively adjacent to each other in circumferential direction are connected with each other via a portion (78,78') extending in circumferential direction, and that these pairs of mixer elements (74) connected with each other are staggered from radial plane to radial plane in circumferential direction.

1. **Author(s):** [Name of author(s)]  
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## **ABSTRACT**

### **Device for mixing two pasty substances, in particular for mixing a dental impression substance with a catalyst substance**

The device for mixing two pasty substances, in particular a dental impression substance with a catalyst substance, is provided with a housing (42) comprising an essentially tubular section (44) having two radial inlet openings (68, 70) for the two pasty substances at its rear end and an outlet opening (52) for the mixed pasty substances at the front end of the tubular section (44), and with a driveable mixer shaft (38) extending through the tubular section (44) and rotatably supported in the housing (42). Said mixer shaft (38) comprises a plurality of rigid mixer elements (74) protruding from an axis (72) and serving for mixing the two pasty substances when they pass through the tubular section (44) of the housing (42). The mixer shaft (38) comprises at the level of the inlet openings (68,70) at least one deflection element (80) for promoting the transport in axial direction of the pasty substances fed through the inlet openings (68,70) to the tubular section (44) of the housing (42), wherein the at least one deflection element (80) has a deflection surface (82) extending about the axis (72) and at an inclination to a radial plane of the axis (72).

Fig. 2



FIG. 1

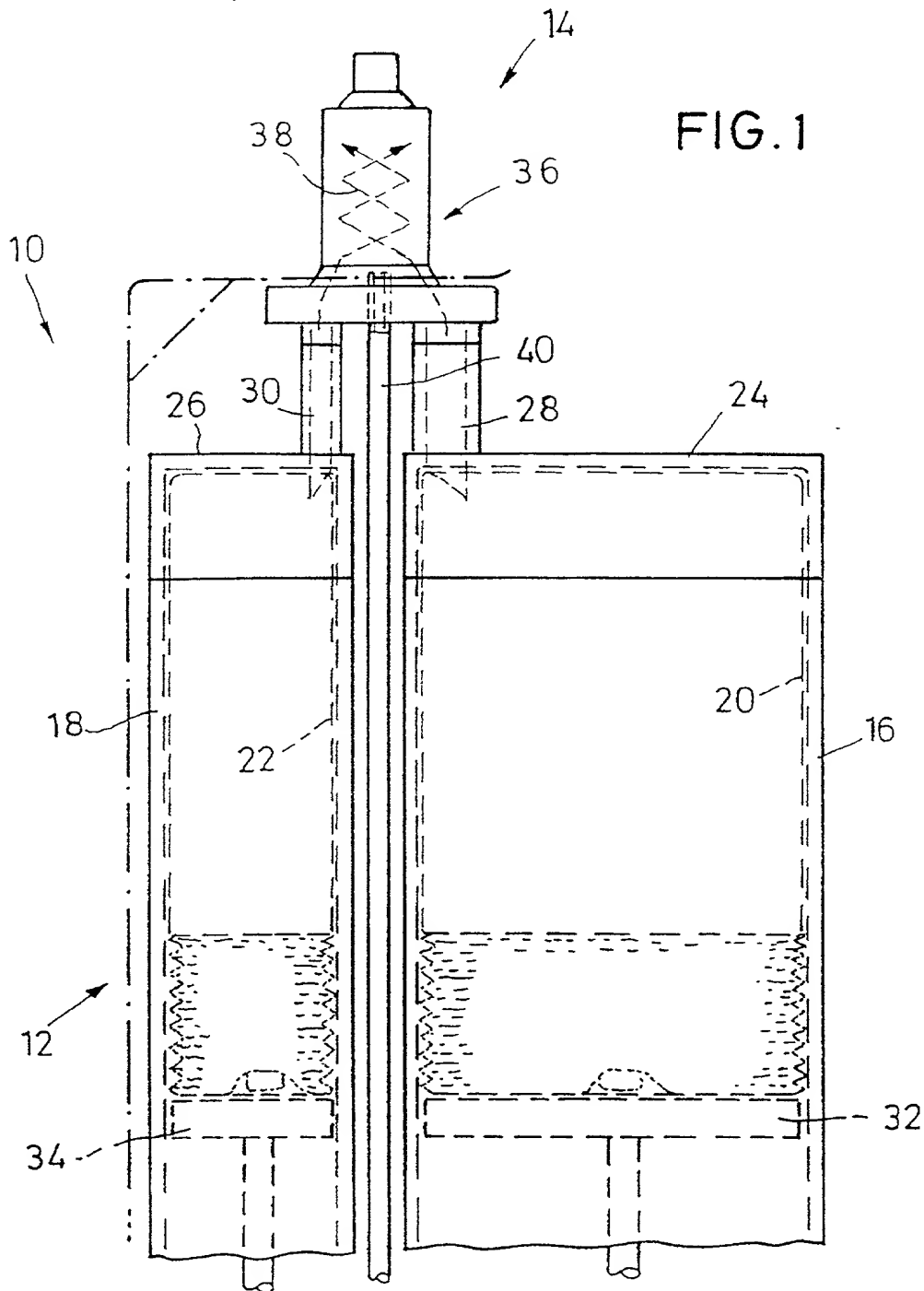


FIG.2

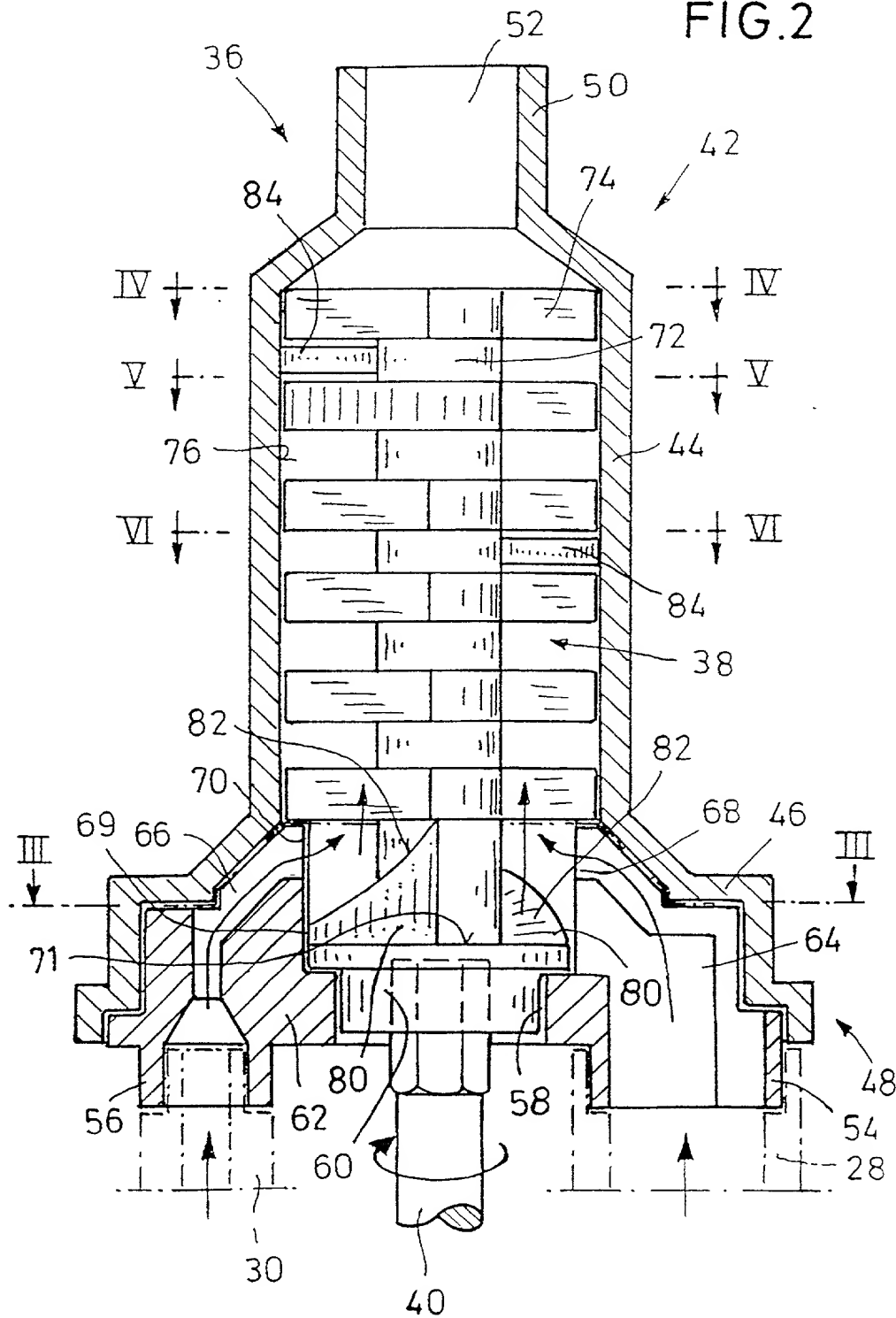


FIG. 3

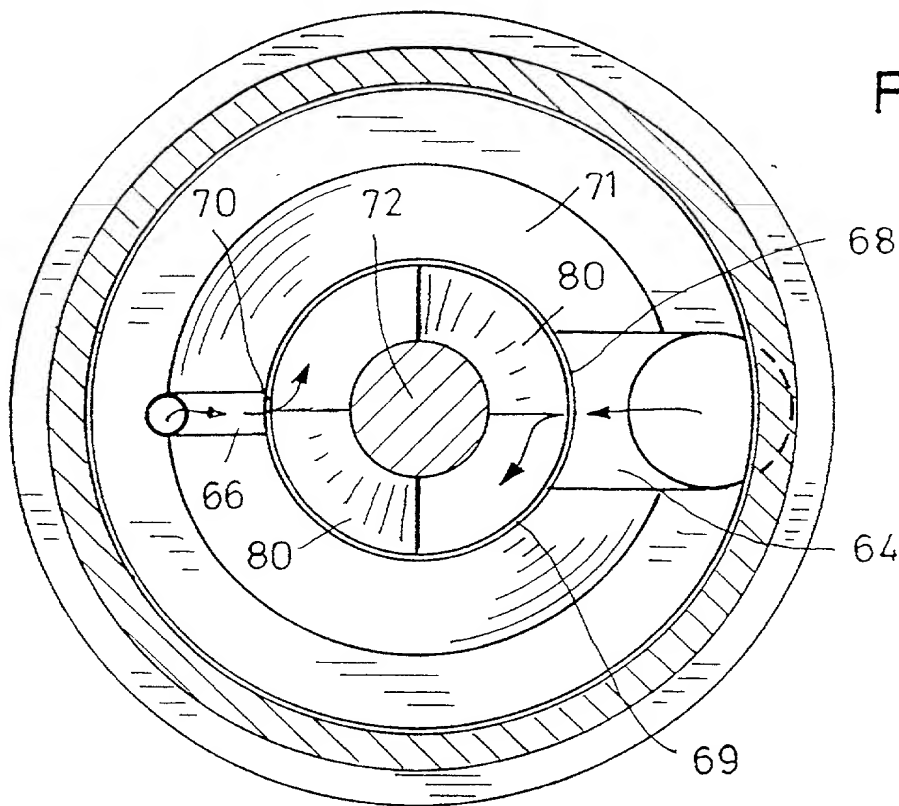


FIG. 4

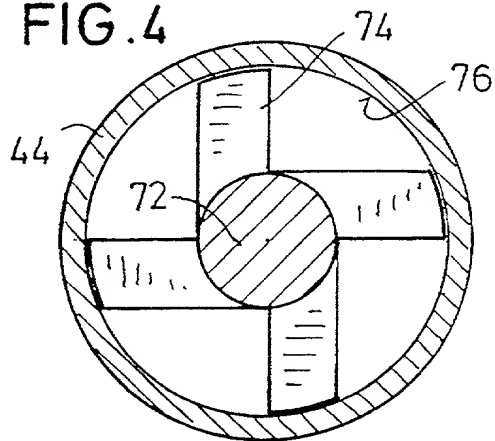


FIG. 5

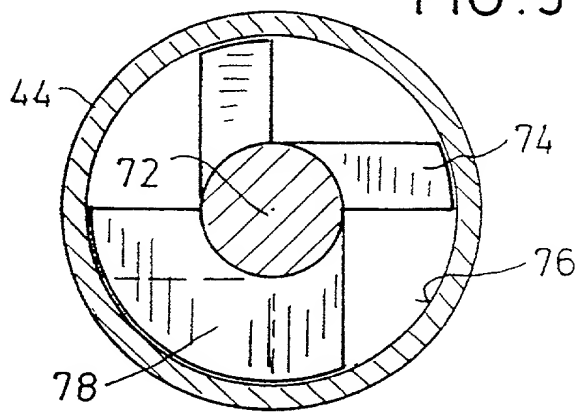


FIG. 6

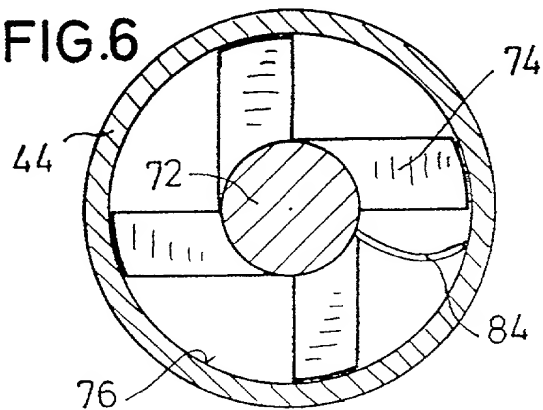
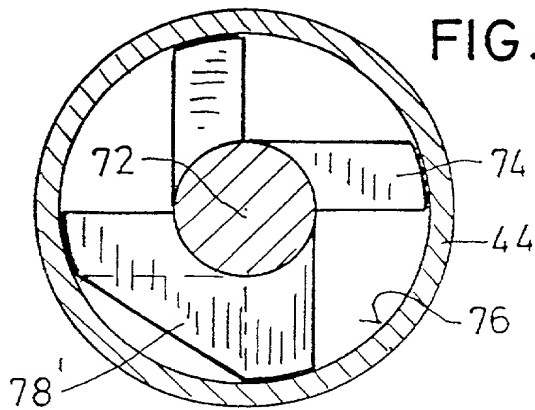


FIG. 7



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**Device for mixing two pasty substances, in particular for mixing a**

**dental impression substance with a catalyst substance**

the specification of which is attached hereto unless one of the following boxes is checked:

☐ The Specification was filed on \_\_\_\_\_ and was assigned

Serial No. \_\_\_\_\_ and was amended on \_\_\_\_\_

☒ was filed as PCT international application number PCT/EP99/07703 on  
October 14, 1999 and was amended under PCT Article 19 on \_\_\_\_\_

(if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof, or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (six months for designs) prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as follows:

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below:

Prior Foreign Application(s)	Priority Claimed
298 18 280.7      Germany      October 14, 1998	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
(Number)      (Country)      (Month/Day/Year Filed)	
(Number)      (Country)      (Month/Day/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Number)      (Country)      (Month/Day/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Number)      (Country)      (Month/Day/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Number)      (Country)      (Month/Day/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No

All Foreign Applications, if any, for any Patent or Inventor's Certificate Filed More Than 12 Months (6 Months for Designs) Prior To The Filing Date of This Application:

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I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status — patented, pending, abandoned)
_____	_____	_____
(Application Serial No.)	(Filing Date)	(Status — patented, pending, abandoned)
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I hereby appoint the following attorneys to prosecute this application and/or an international application based on this application and to transact all business in the Patent and Trademark Office connected therewith and in connection with the resulting patent based on instructions received from the entity who first sent the application papers to the attorneys identified below, unless the inventor(s) or assignee provides said attorneys with a written notice to the contrary:

**Vincent L. Ramik - Registration No. 20,663**

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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